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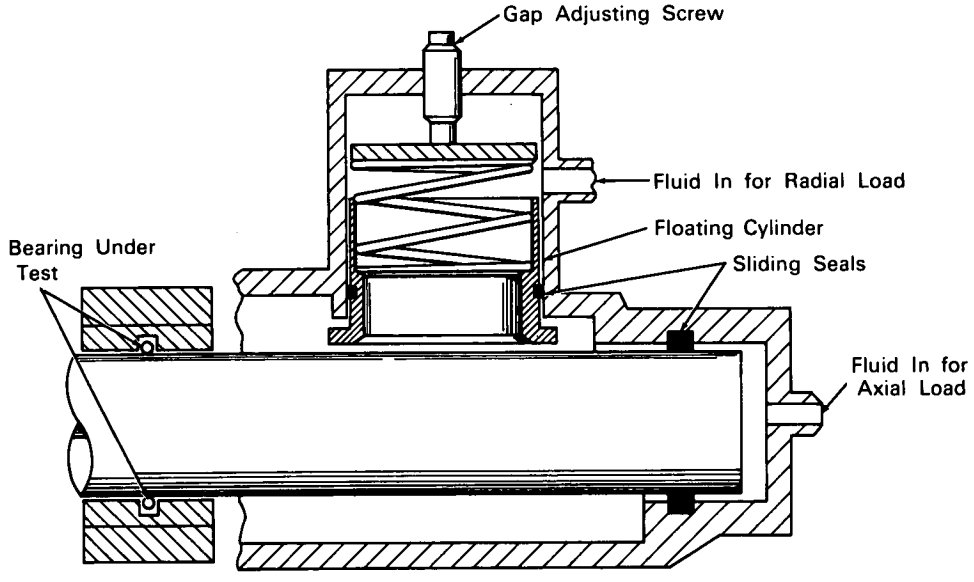
NASA TECH BRIEF

Fluid Pressure Used to Test Turbopump Bearings



The problem: Testing turbopump bearings operating in an intense radiation field. Conventional testers that use oil-lubricated bearings and mechanical devices for applying loads are not suitable in such an environment.

The solution: A bearing tester using fluid bearings to apply radial and axial loads, an induction motor, and the bearing under test, all housed in a sealed container.

How it's done: The bearing to be tested is mounted near the middle of a short shaft. The shaft is driven by an induction motor. At the opposite end of the shaft, space is provided for the fluid bearing that supplies the radial load. Fluid pressure is applied to the end of the shaft to develop the axial load.

The fluid bearing providing radial loading consists of a cavity bounded by the shaft, an outer housing, and a cylinder contoured to fit the shaft. The cylinder is recessed to receive a spring that initially holds it in contact with the shaft. Sufficient fluid pressure is applied to the cavity to provide the desired test load. The cylinder is lifted away from the shaft by the static pressure of the flowing fluid and assumes a position near the shaft. Control of the cylinder-to-shaft gap, and thus the fluid flow rate, is by an adjusting screw that varies spring tension. Axial loading is applied directly to the end of the seal enclosed shaft in a manner similar to that used in a hydraulic ram. Shaft seals in both cases limit the flow of working fluid into the shaft cavity to the desired level.

(continued overleaf)

Notes:

1. This tester has been used successfully at speeds in excess of 27,000 rpm under axial and radial loads to 3,000 pounds.
2. Inquiries concerning this innovation may be directed to:

   NASA Space Nuclear Propulsion Office
   Technology Utilization Branch
   U.S. Atomic Energy Commission Bldg.
   Germantown, Maryland
   Reference: B65-10024

Patent status: NASA encourages commercial use of this innovation. No patent action is contemplated.

Source: Aerojet-General Corporation
under contract to NASA Space
Nuclear Propulsion Office (NU-0001)